

Claims

## 1. A reactive polysaccharide derivative of formula



in which

A is -O-, -S- or  $\begin{matrix} \text{Q}_2 \\ | \\ -\text{N}- \end{matrix}$ ,

$\text{Q}_1$  is hydrogen, the radical  $-\text{B} - \text{A} - \text{Z}_1$ ,  $\text{C}_1\text{-C}_{10}\text{aryl}$  which is unsubstituted or substituted,  $\text{C}_1\text{-C}_{12}\text{alkyl}$  which may be interrupted by oxygen and is unsubstituted or substituted,  $\text{Q}_2$  and  $\text{Q}_3$  are each independently of the other hydrogen,  $\text{C}_1\text{-C}_{10}\text{aryl}$  which is unsubstituted or substituted,  $\text{C}_1\text{-C}_{12}\text{alkyl}$  which may be interrupted by oxygen and is unsubstituted or substituted,

B is an aliphatic or aromatic bridge member,

$\text{Z}_1$  and  $\text{Z}_2$  are each independently of the other a reactive radical of the vinylsulfonyl series, the haloacryloyl series or the heterocyclic series,

PS is a polysaccharide radical,

m is 0, 1 or an integer greater than 1,

n is 1 or an integer greater than 1, and

the sum of  $n+m$  corresponds to the original number of hydroxy groups in the polysaccharide molecule.

## 2. A reactive polysaccharide derivative according to claim 1, wherein

$\text{Q}_1$  is hydrogen, benzyl and  $\text{C}_1\text{-C}_4\text{alkyl}$  which is unsubstituted or substituted by amino, or the radical  $-\text{B} - \text{A} - \text{Z}_1$ , and  $\text{Q}_2$  and  $\text{Q}_3$  are each independently of the other hydrogen, benzyl and  $\text{C}_1\text{-C}_4\text{alkyl}$ .

3. A reactive polysaccharide derivative according to claim 1 or 2, wherein

A is  $\begin{array}{c} Q_2 \\ | \\ -N- \end{array}$ .

4. A reactive polysaccharide derivative according to any one of claims 1 to 3, wherein B is a  $C_2$ - $C_{12}$ alkylene radical, which is unsubstituted or substituted by hydroxy, sulfo, sulfato, cyano or carboxy, and which may be interrupted by 1, 2 or 3 members from the group -N( $R_{1a}$ )- and -O-, in which  $R_{1a}$  is hydrogen or  $C_1$ - $C_4$ alkyl, or  $R_{1a}$  has the meaning indicated for  $Z_1$  according to claim 1.

5. A reactive polysaccharide derivative according to any one of claims 1 to 4, wherein B is 1,2-ethylene, 1,3-propylene or 1,2-propylene.

6. A reactive polysaccharide derivative according to any one of claims 1 to 5, wherein  $Z_1$  is a radical of formula (2a), (2b), (2c), (2d) or (2e)

-CO-(CH<sub>2</sub>)<sub>2</sub>-SO<sub>2</sub>-Y (2a),

-CO-CH(Hal)-CH<sub>2</sub>-Hal (2b),

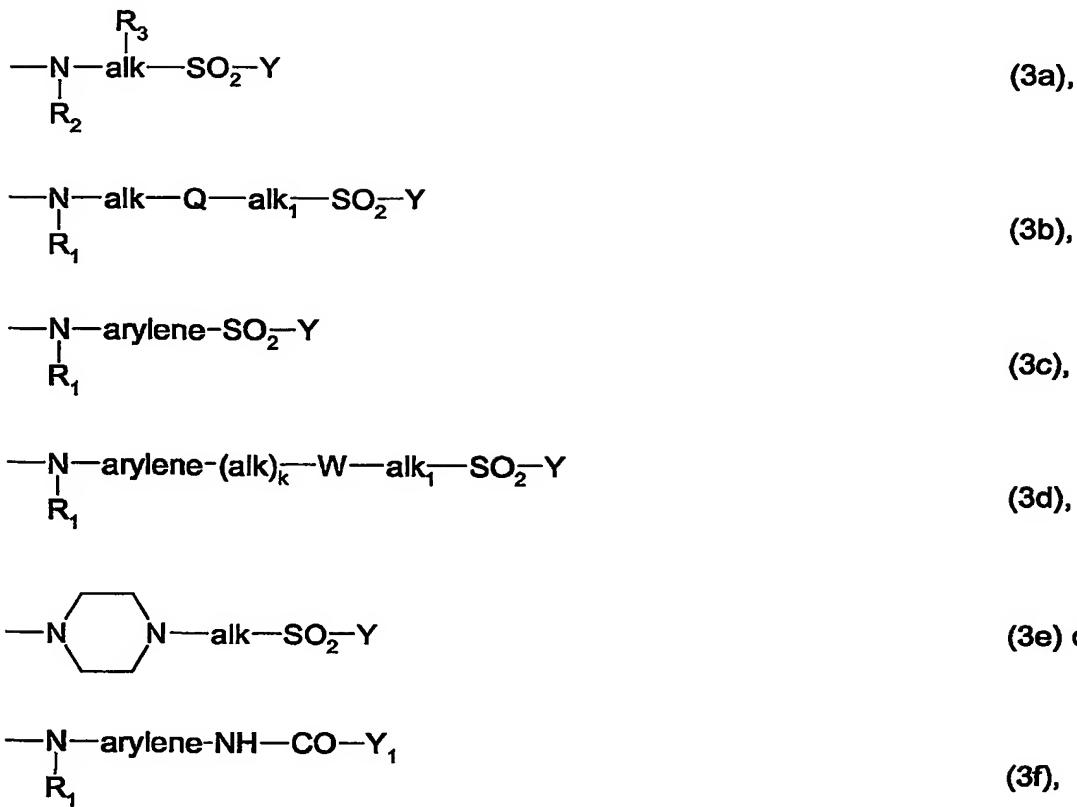
-CO-C(Hal)=CH<sub>2</sub> (2c),



in which

Hal is chlorine or bromine,

$X_1$  is halogen, pyridinium, 3-carboxypyridin-1-yl or 3-carbamoylpyridin-1-yl, or a reactive radical of formula (3a), (3b), (3c), (3d), (3e) or (3f)



in which

$R_1$  is hydrogen or  $C_1$ - $C_4$ alkyl,

$R_2$  is hydrogen,  $C_1$ - $C_4$ alkyl unsubstituted or substituted by hydroxy, sulfo, sulfato, carboxy or

by cyano, or a radical

$R_3$  is hydrogen, hydroxy, sulfo, sulfato, carboxy, cyano, halogen,  $C_1$ - $C_4$ alkoxycarbonyl,  $C_1$ - $C_4$ alkanoyloxy, carbamoyl or a group  $-SO_2-Y$ ,  
 $alk$  and  $alk_1$  are each independently of the other linear or branched  $C_1$ - $C_8$ alkylene, arylene is a phenylene or naphthylene radical unsubstituted or substituted by sulfo, carboxy,  $C_1$ - $C_4$ alkyl,  $C_1$ - $C_4$ alkoxy or by halogen,

$Q$  is a radical  $-O-$  or  $-NR_1-$  wherein  $R_1$  is as defined above,

$W$  is a group  $-SO_2-NR_2-$ ,  $-CONR_2-$  or  $-NR_2CO-$  wherein  $R_2$  is as defined above,

$Y$  is vinyl or a radical  $-CH_2-CH_2-U$  and  $U$  is a group removable under alkaline conditions,

$Y_1$  is a group  $-CH(Hal)-CH_2-Hal$  or  $-C(Hal)=CH_2$  and  $Hal$  is chlorine or bromine, and

$I$  is an integer from 1 to 6 and  $k$  is a number 0 or 1, and

$X_2$  is halogen or  $C_1$ - $C_4$ alkylsulfonyl,

$X_3$  is halogen or  $C_1$ - $C_4$ alkyl,

$T_1$  has independently the same definitions as  $X_1$  above, or is a non-reactive substituent, and  $T_2$  is hydrogen, cyano or halogen.

7. A reactive polysaccharide derivative according to any one of claims 1 to 6, wherein  $Z_1$  is a radical of formula (2a), (2b), (2c) or (2d)

- CO-(CH<sub>2</sub>)<sub>l</sub>-SO<sub>2</sub>-Y (2a),
- CO-CH(Hal)-CH<sub>2</sub>-Hal (2b),
- CO-C(Hal)=CH<sub>2</sub> (2c) or



in which

Y is vinyl,  $\beta$ -chloroethyl or  $\beta$ -sulfatoethyl,

Hal is bromine, l is a number 2 or 3,

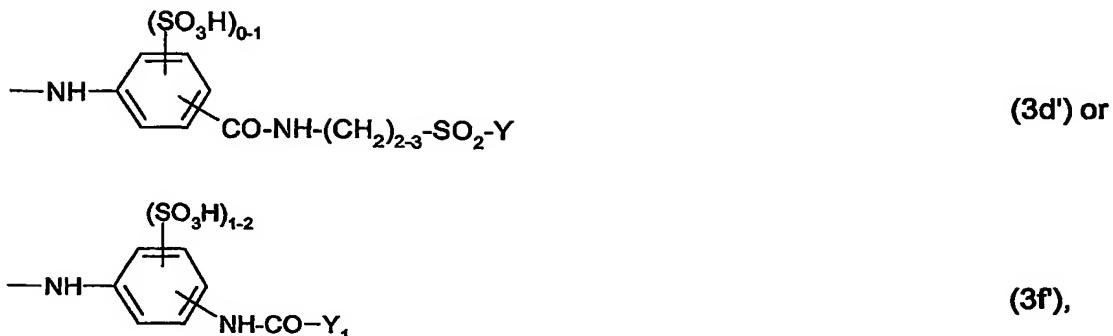
$X_1$  is halogen,

$T_1$  is  $C_1$ - $C_4$ alkoxy,  $C_1$ - $C_4$ alkylthio, hydroxy, amino, N-mono- or N,N-di- $C_1$ - $C_4$ alkylamino unsubstituted or substituted in the alkyl moiety by hydroxy, sulfato or by sulfo, morpholino, or phenylamino or N- $C_1$ - $C_4$ alkyl-N-phenylamino each unsubstituted or substituted in the phenyl ring by sulfo, carboxy, acetylamino, chlorine, methyl or by methoxy and wherein the alkyl is unsubstituted or substituted by hydroxy, sulfo or by sulfato, or naphthylamino unsubstituted or substituted by from 1 to 3 sulfo groups, or is a fibre-reactive radical of formula (3a'), (3b'), (3c'), (3d') or (3f')

-NH-(CH<sub>2</sub>)<sub>2-3</sub>-SO<sub>2</sub>Y (3a'),

-NH-(CH<sub>2</sub>)<sub>2-3</sub>-O-(CH<sub>2</sub>)<sub>2-3</sub>-SO<sub>2</sub>Y (3b'),





in which

$(R_4)_{0-2}$  is 0 to 2 identical or different substituents from the group of methyl, methoxy and sulfo,  
 $Y$  is as defined above, and

$Y_1$  is a group  $-CH(Br)-CH_2-Br$  or  $-C(Br)=CH_2$ .

**8. A reactive polysaccharide derivative according to claim 1 or 2, wherein**

$Z_2$  is a radical of formula (4a), (4b), (4c), (4d), (4e) or (4f)



in which

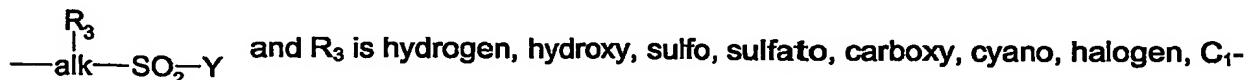
$R_3$  is hydrogen, hydroxy, sulfo, sulfato, carboxy, cyano, halogen,  $C_1-C_4$ alkoxycarbonyl,  
 $C_1-C_4$ alkanoyloxy, carbamoyl or a group  $-SO_2-Y$ ,

alk and  $alk_1$  are each independently of the other linear or branched  $C_1-C_6$ alkylene,

arylene is a phenylene or naphthylene radical unsubstituted or substituted by sulfo, carboxy, C<sub>1</sub>-C<sub>4</sub>alkyl, C<sub>1</sub>-C<sub>4</sub>alkoxy or by halogen,

Q is a radical -O-,

W is a group -SO<sub>2</sub>-NR<sub>2</sub>-, -CONR<sub>2</sub>- or -NR<sub>2</sub>CO- wherein R<sub>2</sub> is hydrogen, C<sub>1</sub>-C<sub>4</sub>alkyl unsubstituted or substituted by hydroxy, sulfo, sulfato, carboxy or by cyano, or a radical



Y is vinyl or a radical -CH<sub>2</sub>-CH<sub>2</sub>-U and U is a group removable under alkaline conditions, Y<sub>1</sub> is a group -CH(Hal)-CH<sub>2</sub>-Hal or -C(Hal)=CH<sub>2</sub> and Hal is chlorine or bromine, and

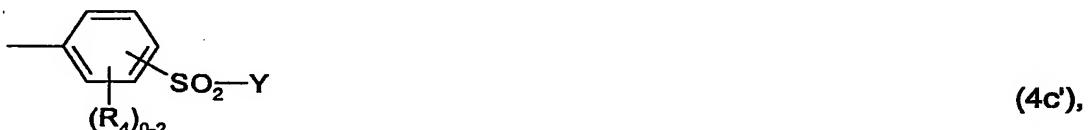
and k is a number 0 or 1, and

the atoms indicated with an asterisk in the reactive radical of formula (4e) together with the

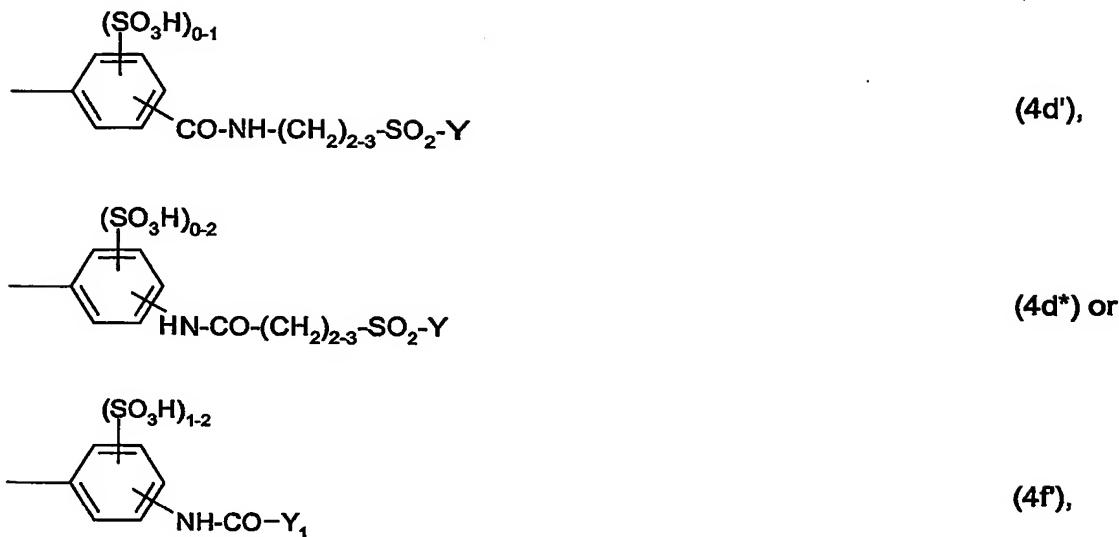
radical of formula  $\begin{array}{c} \text{---N---} Z_2 \\ | \\ Q_3 \end{array}$  form a piperazine ring.

9. A reactive polysaccharide derivative according to claim 1, 2 or 8, wherein

Z<sub>2</sub> is a radical of formula (4a'), (4b'), (4c'), (4c\*), (4d'), (4d\*) or (4f')



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in which

$(R_4)_{0-2}$  is 0 to 2 identical or different substituents from the group of methyl, methoxy and sulfo,

$Y$  is vinyl,  $\beta$ -chloroethyl or  $\beta$ -sulfatoethyl, and

$Y_1$  is a group  $-CH(Br)-CH_2-Br$  or  $-C(Br)=CH_2$ .

**10. A reactive polysaccharide derivative according to any one of claims 1 to 9, wherein n is 1 or 2, especially 1.**

**11. A process for the preparation of a reactive polysaccharide derivative of formula (1a) or (1b), which process comprises the steps of**

**(i) introducing at least one leaving group into the polysaccharide molecule by reaction of a polysaccharide compound of the formula**



**with at least n molar equivalents of a leaving group precursor  $P^*$  to yield the compound of formula**



(ii) reacting the compound of formula (5) with at least n molar equivalents of the compound of the formula



to yield the compound of formula



and allowing the compound of the formula (7) to react with at least n molar equivalents of the compound of the formula



reacting the compound of formula (5) with at least n molar equivalents of the compound of the formula



reacting the compound of formula (5) with at least n molar equivalents of the compound of the formula



wherein

PS, Q<sub>1</sub>, Q<sub>3</sub>, A, B, Z<sub>1</sub>, Z<sub>2</sub>, m and n are as defined in claim 1, and X and P are a leaving group.

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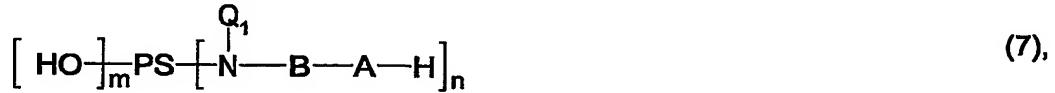
12. A process according to claim 11, wherein the compound of formula (4) corresponds to cyclodextrin or a cyclodextrin derivative.

13. A process for the preparation of compounds or substrates modified with polysaccharides comprising reacting the said compounds or substrates with a polysaccharide derivative according to any one of claims 1 to 10 or a polysaccharide derivative obtained according to claim 11 or 12.

14. A process according to claim 13, wherein textile fiber materials containing hydroxy groups or containing nitrogen are finished with the polysaccharide derivative according to any one of claims 1 to 10 or a polysaccharide derivative obtained according to claim 11 or 12.

15. A process according to claim 14, wherein the textile fiber materials are cellulose containing fiber materials, in particular cotton containing fiber materials.

16. A compound of formula



wherein PS, Q<sub>1</sub>, A, B, m and n are as defined in claim 1, with the exception of  $\beta$ -cyclodextrin which is substituted in the 6-position of one of the D-glucopyranosyl units by 2-aminoethylenamino or 2-hydroxyethylenamino and  $\gamma$ -cyclodextrin which is substituted in the 6-position of one of the D-glucopyranosyl units by 2-aminoethylenamino.